The association of neighborhood-level mass incarceration and psychological distress: An analysis of the Life-course Influences on Fetal Environment (LIFE) study

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Abstract

Background: Psychological distress is an important health problem because of the associated difficulties in social and occupational functioning. Psychological distress, measured by the K-6 Kessler Scale, may be higher among people who live in areas most affected by mass incarceration due to the increased stress that is associated with an overpoliced, under-resourced neighborhood. We examined the relationship between zip-code level incarceration rates and psychological distress in African American women from a Detroit metropolitan area sample.

Methods: We used data from the Life-course Influences on Fetal Environment (LIFE) study, which surveyed a sample of African American women who had just given birth. We dichotomized the scores on the K-6 assessment into mild-to-moderate distress (scores from 6 to 12) and serious psychological distress (13 to 30). Log binomial regression was used to estimate the prevalence ratio and 95% confidence interval for the association between zip-code level incarceration rate and level of psychological distress.

Results: The mean age of the total sample was approximately 27 years old. The median yearly family income was between $30,000 – $34,999 and the median years of education was 14 years. The median K6 score was 13, which corresponds with the cut-off for serious psychological distress. Psychological distress, as measured by the K-6 Scale, was not associated with zip code-level incarceration rate among the sample in the analysis.

Conclusion: The findings do not support an association between zip code prison admission rates and serious psychological distress scores. Further research may be needed to determine the confounding effect of personal/family experiences of incarceration. Another suggestion for additional research includes using a sample with representative rates of diagnosed mental illness.

Keywords: psychological distress, mass incarceration, LIFE study

Introduction

Psychological distress refers to the presence and frequency of anxious and depressive symptomology within the past four weeks. Serious psychological distress (SPD) has been associated with moderate-to-serious impairment in social, occupational, and school functioning[1]. SPD has been linked to negative outcomes across a variety of health outcomes; one recent study looked at the association between SPD and diabetes care. The Egede and Dismuke article researched this association, finding that people with serious psychological distress and comorbid diabetes are less likely to receive preventative services like physician foot checks[2]. Under-utilization of these preventative services by people with SPD may contribute to increased rates of severe secondary conditions like diabetic ulcers.

SPD has also been associated with increased risk of alcohol use disorder (AUD)[3]. In this study, the researchers found that women with past year serious psychological distress were 4.5 times more likely to have past year AUD. They noted that interventions reducing the severity of SPD may have positive consequences for the treatment of AUD. This is evidence that, across a variety of outcomes, psychological distress causes increased morbidity and mortality and is a major contributor to health disparities [3,4].

African Americans experience some of the greatest burdens of excess morbidity and mortality when compared to white Americans[5]. While some of the research looks towards differential health behaviors to explain these disparities[6], it is clear that these differences do not explain most of this excess burden [7,8]; instead, the institutions in the United States play a much larger role in sustaining and creating health disparities.

Racism operates on several levels including interpersonal and institutional (not exhaustive). At the interpersonal level, the Chae et al. article (2011) provided evidence that people who reported experiences of racial discrimination had a significantly higher odds of meeting the criteria for serious psychological distress[9]. In this study of African Americans and Caribbean Black people, 89.0% reported experiencing discrimination, with 63.5% attributing that discrimination to race.

Racism also negatively impacts health at the systemic level. Institutions and policies that were built for white Americans without regard for – or to intentionally oppress [10,11] – African Americans have a major impact on health outcomes [12]. The criminal justice system is a prime example of systemic racism and its consequences [10, 13]. In 2014, there were 2.3 million African Americans incarcerated in the United States; African Americans are incarcerated at more than 5 times the rate of white Americans[14]. Studies have documented the negative health effects of incarceration of a family member on psychosocial outcomes [15] ; however, there is limited information on the impacts of neighborhood-level incarceration rates on psychological distress.

Methods

Data Source and Sample:

We performed a secondary data analysis using the Life-course Influences on Fetal Environment (LIFE) study. The data source is a retrospective cohort study of self-identified African American women living in the Detroit metropolitan area (n = 1,411). The women were recruited from a hospital in Oakland County, Michigan between the years 2009-2011 after the delivery of singleton infants. Interviews were conducted in-person during the woman's hospital stay. Women were excluded from the study if they did not speak English, had intellectual

disabilities or serious mental illness, or were currently incarcerated. The initial study which produced this dataset aimed to analyze the impact of preconception neighborhood mass incarceration on preterm birth outcomes. Because the exposure of interest occurred before the study, they selected women who enrolled in 2010 and reported their 2008 address (n = 493), as well as women who enrolled in 2009 and reported living at their current residence for at least 12 months (n = 189) [16]. An additional n = 30 were excluded from the analysis due to missing values for either incarceration rate or Kessler score, for a final sample of 652 women.

Incarceration Rate:

The incarceration rate statistic was pulled from the Justice Atlas of Sentencing and Corrections for the year 2008[17]. Our study looked at preconception incarceration rates (due to the prior literature's focus on mass incarceration's impact on preterm birth outcomes[16]), therefore, the incarceration data was gathered from a year prior to the participants' deliveries. This zip code-level data was then spatially linked with zip codes of the survey respondents for the same year. The prison admission rates used in the analysis were based per 1,000 adults, with the range admission rate from 0/1,000 adults to 10.6/1,000.

Psychological Distress:

Psychological distress was estimated from the total score from the K6 Kessler Scale[18, 19]. The Kessler Scale measures the self-reported frequency of negative feelings (anxiety, depression, hopelessness) in the past 30 days. This interviewer-administered assessment asks six questions to the respondent; in the past 30 days, how often did you feel: 1) nervous, 2) hopeless, 3) restless or fidgety, 4) so depressed that nothing could cheer you up, 5) that everything was an effort, 6) worthless? Results of this assessment are coded on a scale of one to five for each section, with a

score of one being “All of the time” and a score of five being “None of the time”. The score for each item is then added for a total score of 6-30, with 6 being the highest psychological distress score and 30 being the lowest/least psychological distress. The scores were reverse coded so that, in the analysis, higher scores correlate with higher levels of psychological distress. Scores with a value of 6 were then assigned a score of 30, 5 changed to 29, and so on.

After testing the assumptions of linear regression, we found that there was no linear relationship between our independent and dependent variable (Figure 1). Therefore, in the analysis, total K-6 scores were transformed into a dichotomous variable: a score of <13 and scores ≥13. This cut point was determined by prior literature, including Sealy-Jefferson et al. (2016) and the Kessler et al. article (2003), which defined serious psychological distress as a score of 13 or above, with below 13 signifying mild to moderate psychological distress. This score was also the median of our dataset. There is evidence that this scale is highly effective in predicting psychiatric disorders when compared to other measures[9].

Statistical Methods:

Log binomial regression was used to estimate prevalence ratios and 95% CIs for associations between zip code incarceration rate and Kessler score. The log binomial regression was used because the outcome variable was dichotomized and the prevalence of the outcome of interest (K-6 Kessler Score ≥13) was greater than 10%.

Because there were doubts about the linearity of the model, we also conducted a 2 Sample T-Test. For this test, we kept the K6 variable as a continuous variable and dichotomized the exposure variable (incarceration rate) at the median value. The median incarceration rate was 2.82, so the variable was converted into a variable with <2.82 and ≥2.82 as the categories.

The covariates tested included presence of a serious health condition, age, family income, drug use, educational attainment, and smoking habits. The prevalence ratio estimates before and after the inclusion of the potential covariate (including them one-by-one into the model) was put into an Excel file for a percent change analysis. After conducting the percent change analysis on the potential covariates, none of them changed the unadjusted model by more than 10%, therefore they were not included in the final models. The final models are presented unadjusted.

Results

We conducted the analysis using SAS software. Table 1 shows the demographic characteristics of the participants by psychological distress score (mild to moderate: <13, serious: ≥13). The mean age of the total sample was approximately 27 years old. The median yearly family income was between $30,000 – $34,999 and the median years of education was 14 years. The average age of the group with K6 scores from 6-12 was 28.5 years, while the average age of the group with scores from 13-30 was 26.3 years. The median yearly family income of the mild to moderate psychological distress group was $35,000 – $39,999, while the median yearly family income of the serious psychological distress group was $30,000 – $34,999. The median years of education completed was 14 for both groups.

A histogram of the distribution of K-6 Kessler Scores and descriptive statistics on the variable was created using SAS. The median K-6 Kessler Score for the sample was 13. The median corresponded to the cut-off score for severe psychological distress, meaning that half of the sample (excluding missing values) had the outcome of interest. Figure 2 shows a breakdown of the respondent's K6 Scores. Of the respondents who reported a K-6 Kessler Score (N=652), 46.31% (N=302) participants had scores from 6-12 and 53.68% (N=350) respondents had scores of 13 to 30.

The unadjusted log binomial regression model has a prevalence ratio of 1.03 (95% CI: 0.99-1.07) for serious psychological distress. This RR is not statistically significant; therefore, we have not shown any association between incarceration rate and risk of serious psychological distress.

For the t-test, the sample mean K6 score of the lower-incarceration group (<2.82) was 13.06. The sample mean of the higher-incarceration rate group (≥2.82) was 13.41. The t-value for this test was -1.06 (p = .29). This t-test showed no evidence of a significant effect of incarceration rate on K6 scores.

Discussion

We found no evidence that higher zip code incarceration rates are associated with having serious psychological distress. From this study and the literature review conducted, there appears to be gaps in the literature on the impacts of neighborhood-level incarceration rates on psychosocial outcomes like psychological distress. Although this study did not find a significant association between zip-code level incarceration rates and psychological distress scores in this sample, there may still be an association when analyzing different neighborhood-level exposures, since this measure (psychological distress) is more effective than other psychosocial measures in detecting elevated stress among African American people [20].

Neighborhood-level factors are especially important to study because of the residential segregation that is present in the United States [21]. Mass incarceration is concentrated in neighborhoods with high Black and Latino populations, which also experience disenfranchisement through other neighborhood-level factors including healthy food inaccessibility and unemployment [22, 23, 24]. These neighborhoods are disparately impacted by over

policing[25], poverty[26], and other forms of inequality, and exist within a very different social climate than those neighborhoods that have very little interaction with the criminal justice system [12, 21]. The negative psychosocial outcomes that result from residing in a high-incarceration neighborhood may be better explained by other neighborhood factors that are also present in these communities, or by studying the cumulative effect of these factors.

Prior studies found that people who felt closely tied to their racial group had a protective effect against negative psychosocial outcomes like psychological distress[9]. Racial group identification was divided into three separate variables: Black identity – centrality, Black identity – private, and Black identity – public. These three variables measured: how central being Black is to the respondent's identity, positive feelings and pride about being Black, and how society views/treats Black people. However, when we tested these variables as confounders, we found that they did not significantly alter the model.

Psychological distress may also be associated with negative birth outcomes, including preterm birth[27]. Sealy-Jefferson et al. (2016) examined the relationship between perceived neighborhood context and preterm birth, looking at psychological distress as a mediating factor. They found that more women who had a preterm birth reported poor psychosocial indicators, including psychological distress. While they found no evidence that psychological distress was on the pathway linking perceived neighborhood context to preterm birth, they have not explored the pathway from mass incarceration to preterm birth with psychological distress as a mediator.

Sealy-Jefferson et al. (2020) explored the mass incarceration variable in depth[16]. They measured preconception mass incarceration through several variables: percent of people admitted to prison on the basis of a new conviction through the court, percent of those who were admitted on the basis of a revocation from parole or probation supervision, prevalence of admissions, and

estimated cost of imprisonment. This study found that higher preconception zip code prison admission costs predicted higher preterm birth risk among women under 35 years old. The results were highly age and marriage status-dependent, which our analysis did not mirror. The study also cites chronic stress as a mechanism for mass incarceration's connection to preterm birth outcomes. Our study intended to build off this hypothesis by testing the association between mass incarceration and a stress measure (psychological distress). While we found no association, the stress measure we used was only designed to assess psychological state in the last 12 months[18]. Further testing of this hypothesis is warranted to determine if lifetime exposure to mass incarceration is associated with increased serious psychological distress or other negative mental health outcomes.

Limitations

There were several notable limitations in this study. This analysis did not take into account the hierarchical nature of the data, and it is possible that psychological distress may vary by zip codes. Future research should examine whether significant clustering exists and examine the association of interest using multi-level models. Additionally, there was no measure of personal experiences with incarceration (including incarceration of a family member, etc.) that could have contributed to the individual's psychological distress score and potentially had a confounding effect on the result.

Another limitation was the exclusion of people with significant mental illness. In the exclusion criteria, women with significant mental illness were ineligible to participate in the study. Presence of significant mental illness was determined by a review of prior mental health

diagnoses and medical records. Removing women with significant mental illness likely removed women with scores above the cut-off for serious psychological distress. The conclusions that resulted from this study, therefore, are only applicable to African American women without a previously diagnosed mental illness. Among women who have a diagnosed mental illness, or in a population with representative diagnosis rates, there may be a differential impact of neighborhood-level mass incarceration.

Along with these limitations in study demographics and model design, there are also limitations regarding the scale used for psychological distress determination. There is evidence that the K-6 Kessler Scale is the most effective measure of serious psychological distress and serious mental illness compared to the other available measures[20]; however, the study populations that the scale was tested on were mostly white[18, 19] .

One of the few studies that had a majority African American sample of women tested the measure in incarcerated women, which is likely not generalizable to non-incarcerated women due to the unique circumstances around incarceration[28]. Even though this study is likely not generalizable to all African American women, they did find that there were possible limitations in the cut-off point used to detect serious psychological distress and mental illness that may be significant for this study. Using a K-6 score of ≥13 as an indicator of serious psychological distress had a significant rate of false negatives among their study population. They found that a cut-off score of 13 was excluding women who were diagnosed with a mental health disorder using other screening tools that measure significant functional impairment.

In this study, the cut-off score of ≥13 was used to determine serious psychological distress due to the prior research validating its efficacy and because it was also the median of the sample. Although the research supports this cut-off score for the populations they studied

(mostly white and male), it may not be the most effective measure for this sample because this sample does not fit those demographics. After conducting a log binomial regression using a cut point of 11 (lower quartile) and 15 (upper quartile); however, we found no significant difference in the results of the model.

Conclusions

Women who live in neighborhoods with high levels of incarceration were not at a higher risk of having serious psychological distress (K6 score of 13 or above). While there was no significant association shown in our data, there may be an association when factoring individual experiences with incarceration into the model, or when having a representative sample of women with diagnosed mental illness.

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Appendix A

Table 1:

Demographic characteristics of the sample by Kessler Score

	Mild to Moderate Psychological Distress <13 (*n* = 302)	Serious Psychological Distress ≥13 (*n* = 350)	RR	95% CI
Average Age (SD)	28.5 (6.25)	26.3 (5.89)	0.97	0.96, 0.98
Median Yearly Family Income	$35,000-$39,999	$30,000-34,999	0.97	0.96, 0.99
Median Years of Education	14	14	0.92	0.89, 0.96
Married *N (%)*	Yes: 108 (36.12) No: 191 (63.88)	Yes: 72 (20.81) No: 274 (79.19)	0.68	0.56, 0.82
Before you became pregnant did you have: Asthma *N (%)*	Yes: 51 (17.83) No: 235 (82.17)	Yes: 68 (20.18) No: 269 (79.82)	0.98	0.94, 1.02
Diabetes *N (%)*	Yes: 9 (3.14) No: 278 (96.86)	Yes: 8 (2.38) No: 328 (97.62)	1.04	0.91, 1.18
Hypertension *N (%)*	Yes: 13 (4.58) No: 271 (95.42)	Yes: 9 (2.70) No: 324 (97.30)	1.07	0.95, 1.22
Thyroid problems *N (%)*	Yes: 15 (5.24) No: 271 (94.76)	Yes: 12 (3.56) No: 325 (96.44)	1.05	0.95, 1.17
Other health problems *N (%)*	Yes: 31 (10.80) No: 256 (89.20)	Yes: 52 (15.32) No: 282 (84.68)	0.96	0.91, 1.00

Figure 1:

Scatterplot of the K6 Kessler Scores by Incarceration Rate

Figure 2:

Distribution of total Kessler Scores for the full sample of women

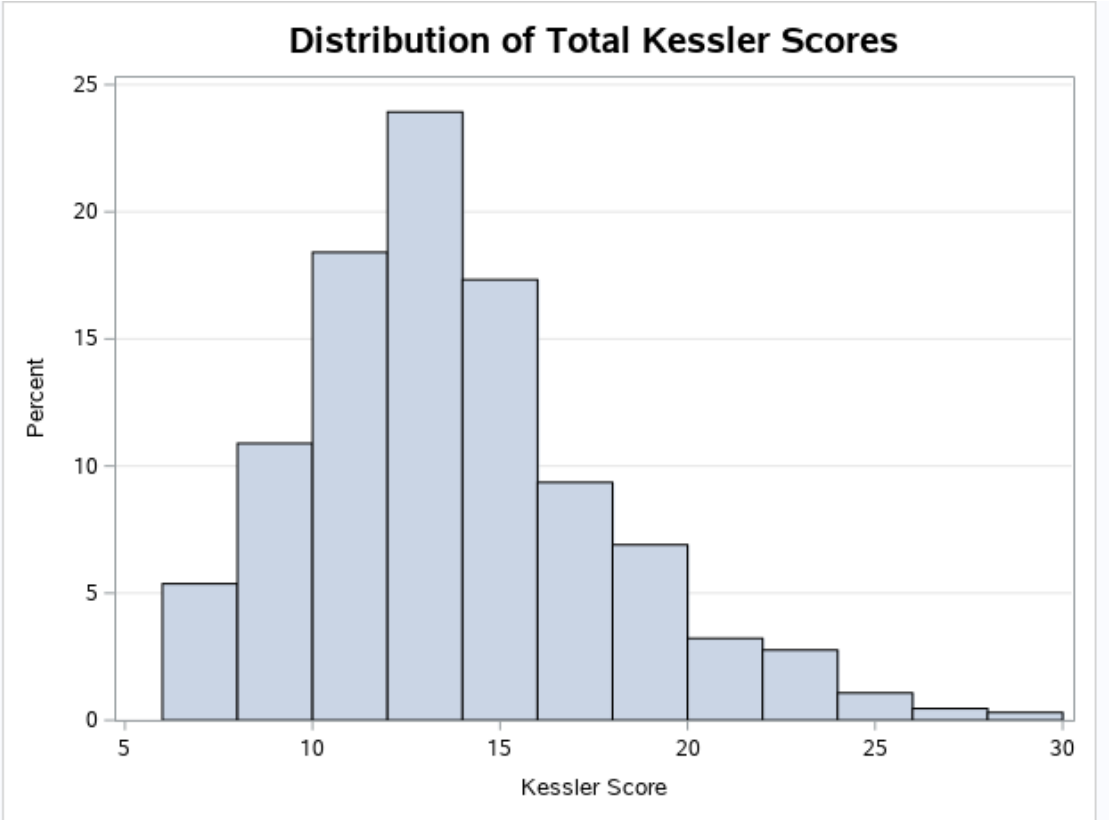

Table 2:

Associations between preconception mass incarceration and risk of serious psychological distress: Life-course Influences on Fetal Environments Study (2009–2011)

	Serious Psychological Distress – Kessler Score (K6 Score) ≥ 13 RR (95% CI)
Prison admission rate/1,000 people	1.03 (0.99-1.07)

P value for this analysis was 0.14